

Claims

1. Aqueous sol containing silica-based particles, characterised in that it has an S-value within the range of from 10 to 45%, a viscosity within the range of from 5 to 40 cP and a molar ratio of  $\text{SiO}_2$  to  $\text{M}_2\text{O}$ , where M is alkali metal or ammonium, within the range of from 10:1 to 40:1.
2. Aqueous sol containing silica-based particles, characterised in that it has an S-value within the range of from 10 to 45%, a viscosity within the range of from 5 to 40 cP and a silica content of at least 10% by weight.
3. Aqueous sol according to claim 1, characterised in that it has a silica content of at least 10% by weight..
4. Aqueous sol according to claim 1, 2 or 3, characterised in that the silica-based particles have a specific surface area within the range of from 775 to 1050  $\text{m}^2/\text{g}$ .
5. Aqueous sol according to claim 1, 2 or 3, characterised in that the silica-based particles have a specific surface area within the range of from 550 to 725  $\text{m}^2/\text{g}$ .
6. Aqueous sol according to any of claims 1 to 5, characterised in that the S-value is within the range of from 20 to 40%.
7. Aqueous sol according to any of claims 1 to 6, characterised in that the viscosity is within the range of from 7 to 25 cP.
8. Aqueous sol according to any of claims 1 to 7, characterised in that it has a molar ratio of  $\text{SiO}_2$  to  $\text{M}_2\text{O}$ , where M is alkali metal or ammonium, within the range of from 15:1 to 30:1.
9. Aqueous sol according to any of claims 1 to 8, characterised in that it has a pH of at least 10.6.
10. Process for the production of silica-based particles, characterised in that it comprises the steps of
  - (a) acidifying an aqueous silicate solution to a pH of from 1 to 4 to form an acid sol,
  - (b) alkalisng the acid sol at an  $\text{SiO}_2$  content within the range of from 4.5 to 8% by weight to a pH of at least 7,
  - (c) allowing particle growth of the alkalisng sol for at least 10 minutes, and then
  - (d) alkalisng the obtained sol to a pH of at least 10.0.
11. Process for the production of silica-based particles, characterised in that it comprises the steps of
  - (a) acidifying an aqueous silicate solution to a pH of from 1 to 4 to form an acid sol,
  - (b) alkalisng the acid sol at an  $\text{SiO}_2$  content within the range of from 4.5 to 8% by weight,
  - (c) heat-treating the alkalisng sol at a temperature of at least 30°C, and then

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(d) alkalisising the heat-treated sol to a pH of <sup>16</sup> at least 10.0.

12. Process according to claim 10 or 11, characterised in that the alkalisation according to (b) and (d) is carried out by means of an aqueous silicate solution.

13. Process according to claim 10, 11 or 12, characterised in that the  
5 particle growth and heat-treatment according to (c) is carried out at a temperature within the range of from 35 to 95°C.

14. Process according to claim 10, 11, 12 or 13, characterised in that the particle growth and heat-treatment according to (c) is carried out for 20 to 240 minutes.

15. Process according to any of claims 10 to 14, characterised in that  
10 the alkalisation according to (d) produces a silica-based sol having a molar ratio of  $\text{SiO}_2$  to  $\text{M}_2\text{O}$ , where M is alkali metal or ammonium, within the range of from 15:1 to 30:1 and a pH of at least 10.6.

16. Silica-based particles obtainable by a process according to any of claims 10 to 15.

15 17. Use of silica-based particles according to any of claims 1 to 9 or 16 or produced by a process according to any of claims 10 to 15 as drainage and retention aids in the production of paper.

18. Process for the production of paper from an aqueous suspension containing cellulosic fibres, and optional fillers, which comprises adding to the suspension silica-based  
20 particles and at least one charged organic polymer, forming and draining the suspension on a wire, characterised in that the silica-based particles are present in an aqueous sol according to any of claims 1 to 9 or produced by a process according to any of claims 10 to 15.

19. Process according to claim 18, characterised in that the charged  
25 organic polymer is cationic starch or cationic polyacrylamide.

20. Process according to claim 18 or 19, characterised in that before adding the silica-based particles to the suspension the silica-based particles are diluted or mixed water to form an aqueous sol having a silica content of from 0.05 to 5% by weight.

21. Process according to any of claims 18 to 20, characterised in that  
30 the silica-based particles are added to the suspension in an amount of from 0.005 to 0.5% by weight, calculated as  $\text{SiO}_2$  and based on dry cellulosic fibres and optional fillers.

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